



## **WATER RESOURCES RESEARCH GRANT PROPOSAL**

**Project ID:** 2005MN147G

**Title:** Assessing the ecotoxicology of alkylphenol mixtures across the aquatic food chain

**Project Type:** Research

**Focus Categories:** Water Quality, Toxic Substances, Ecology

**Keywords:** Alkylphenol, Bioassay, Fathead minnow, diatom, daphnia, wastewater

**Start Date:** 09/01/2005

**End Date:** 08/31/2007

**Federal Funds:** \$63,014

**Non-Federal Matching Funds:** \$81,257

**Congressional District:** 6

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**Abstract**

Alkylphenols (AP), a group of compounds used in large quantities as industrial and household surfactants, were recently discovered in many surface water samples and even in some drinking waters. Wastewater effluent was identified as a major portal for the influx of these complex mixtures into the aquatic environment. APs are known to bind to the estrogen receptor of mammalian cells and the ubiquitous presence of these biologically active compounds in surface waters should be of environmental and human health concern. To date, AP studies have focused on 4-nonylphenol, the metabolic product of both aerobic and anaerobic microbial degradation of higher-chained APs. However, higher chained APs account for the vast majority of all APs in wastewater (Ferguson et al. 2001; Rice et al. 2003) and several studies have demonstrated their estrogenic activity (Lee et al. in review). Recent preliminary studies in our combined laboratories have indicated the presence of large quantities of APs in the aquatic ecosystem in Minnesota (Barber et al. 2000, Kolpin et al. 2001) and demonstrated their combined effects on two components of the aquatic food chain (diatoms and fathead

minnows). In this study, we propose to examine the effects of AP mixtures on three tiers of the aquatic food chain: the primary producer community (diatoms), a primary consumer (daphnia), and a vertebrate near the top of the food chain (the fathead minnow). We furthermore will link all three tiers through feeding trials to examine the effects of AP mixtures on the aquatic food chain and on the reproductive ability of an aquatic vertebrate near the top of the trophic cascade. Specifically, we propose three objectives: (1) determine the effects of AP exposure on the reproductive success of three tiers of the aquatic food chain; (2) determine the impacts of AP mixtures across the food chain; and (3) to test the three assays at a field site known to discharge APs. These three assays will be readily applicable to numerous other contaminants detected in local and national waterways and will provide the first comprehensive biological assessments of the impacts of an important class of environmental estrogens on the aquatic environment.